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## ALGEBRA.

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**113. Proposd by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.**

Find a square number consisting of 24 figures such that the numbers formed by the first 12 figures and the last 12 figures, respectively, are consecutive, and *vice versa.*

**Solution by the PROPOSER.**

(1). Let $y^2=1000000000001x+1000000000000$ be the number.

$\therefore 1000000000001x=y^2-1000000000000$.

$$\therefore\ x=\frac{(y+1000000)(y-1000000)}{10001\times99990001}.$$

Let $y+1000000=99990001u$, $y-1000000=10001v$.

$\therefore 10001v=99990001u-2000000$. $v=9998u-199+\dfrac{3u-9801}{10001}$.

Let $S=\dfrac{3u-9801}{10001}$. $\therefore u=\dfrac{10001S+9801}{3}=3333S+3267+\dfrac{2S}{3}$.

Let $S=3m$. $\therefore u=10001m+3267$.

$y=1000000000001m+326666333267$.

$x=(99990001m+32663267)(10001m+3267)$.

Let $m=0$. $\therefore y=326666333267$, $x=106710893289$.

$y^2=106710893290106710893289=1000000000000(x+1)+x$.

(2). $y^2=1000000000001x+1$, or $x=\dfrac{(y+1)(y-1)}{(10001)(99990001)}$.

$y+1=99990001u$, $y-1=10001v$.

$\therefore\ v=\dfrac{9998u+(3u-2)}{10001}=9998u+S$. $\therefore u=\dfrac{3333S+(2S+2)}{3}=3333S+t$.

$\therefore S=t-1+\frac{1}{2}t=t-1+m$. $\therefore S=3m-1$, $u=10001m-3333$.

$y=1000000000001m-333266673334$.

$x=(10001m-3333)(99990001m-33323335)$.

Let $m=1$.

$\therefore y=666733326667$, $x=444533328888$.

$y^2=444533328888444533328889=1000000000000x+(x+1)$.

**114. Proposed by ELMER SCHUYLER, B. Sc., Professor of German and Mathematics in Boys' High School, Reading, Pa.**

$$\left.\begin{array}{l} bx^3=10a^2bx+3a^3y \\ ay^3=10b^2ay+3b^3x \end{array}\right\}$$